I Claim:

1.

A pressure control valve, comprising:

a valve body having a valve bore with a valve seat and a longitudinal axis, the valve bore having at least a portion with a diameter that increases non-uniformly from its upstream end closest to the valve seat to its downstream end; and

a valve head received at least in part in the valve bore, yieldably biased to a closed position against the valve seat, and being moveable to an open position spaced from the valve seat to allow fluid to flow through the valve bore;

an interface angle is defined at least when the valve head is displaced from the valve seat, the interface angle being defined between said longitudinal axis and an interface line intersecting a point on the valve head closest to the valve bore and a point of the valve bore closest to the valve head, and said interface angle increases as the valve head is increasingly displaced from the valve seat.

2.

The pressure control valve of claim 1 which also comprises a spring yieldably biasing the valve head against the valve seat, the spring being disposed downstream of the valve head such that increasing displacement of the valve head away from the valve seat causes increasing displacement of the spring.

3.

The pressure control valve of claim 1 wherein the valve bore has a concave portion with a diameter that increases non-linearly as the concave portion extends downstream.

4.

The pressure control valve of claim 1 wherein the concave portion is generally arcuate.

5.

The pressure control valve of claim 1 wherein the valve bore is defined at least in part by a plurality of linearly tapered segments arranged so that the valve bore as a whole is not linearly tapered along its entire axial length.

6.

The pressure control valve of claim 1 wherein the valve head is a spherical valve ball having a diameter that is greater than the diameter of the valve bore in the area of the valve seat.

7.

The pressure control valve of claim 6 wherein the interface line intersects the center of the valve ball and the location of the valve bore closest to the valve ball.

8.

The pressure control valve of claim 5 wherein the interface line is defined within the portion of the valve bore defined by said plurality of linearly tapered segments and the interface line is perpendicular to the valve bore in at least some positions of the valve head when the valve head is spaced from the valve seat.

9.

The pressure control valve of claim 2 wherein the spring is a coil spring having a spring rate and increased displacement of the valve head away from the valve seat causes an increase in the force of the spring acting on the valve head, the valve bore being constructed so that the interface angle increases as a function of the spring rate of the spring.

10.

The pressure control valve of claim 9 wherein the interface angle increases as a function of the spring rate of the spring to offset the increased spring force that acts on the valve head as the valve head is increasingly displaced from the valve seat.

11.

The pressure control valve of claim 10 wherein the interface angle increases as the valve head is increasingly displaced from the valve seat so that the valve has a substantially constant pressure response for fluid flow rates through the valve of between about 10 liters per hour and 250 liters per hour.

12.

A pressure control valve, comprising:

a valve body having a valve bore with a valve seat and a longitudinal axis, the valve bore having at least a portion with a diameter that increases non-uniformly from its upstream end closest to the valve seat to its downstream end; and

a valve ball yieldably biased to a closed position against the valve seat, and being moveable to an open position spaced from the valve seat to allow fluid to flow through the valve bore;

an interface angle is defined between said longitudinal axis and a line intersecting a center of the valve ball and the location of the valve bore closest to the valve ball, and said interface angle increases as the valve ball is increasingly displaced from the valve seat.

13.

The pressure control valve of claim 12 which also comprises a spring yieldably biasing the valve ball against the valve seat, the spring being disposed downstream of the valve ball such that increasing displacement of the valve ball away from the valve seat causes increasing displacement of the spring.

14.

The pressure control valve of claim 12 wherein the valve bore has a concave portion with a diameter that increases non-linearly as the concave portion extends downstream.

15.

The pressure control valve of claim 12 wherein the concave portion is generally arcuate.

16.

The pressure control valve of claim 12 wherein the valve bore is defined at least in part by a plurality of linearly tapered segments arranged so that the valve bore as a whole is not linearly tapered along its entire axial length.

17.

The pressure control valve of claim 13 wherein the spring is a coil spring having a spring rate wherein increased displacement of the valve head away from the valve seat causes an increase in the force of the spring acting on the valve head, the valve bore being constructed so that the interface angle increases as a function of the spring rate of the spring.

18.

The pressure control valve of claim 17 wherein the interface angle increases as a function of the spring rate of the spring to offset the increased spring force that acts on the valve head as the valve head is increasingly displaced from the valve seat.

19.

The pressure control valve of claim 18 wherein the interface angle increases as the valve head is increasingly displaced from the valve seat so that the valve has a substantially constant pressure response for fluid flow rates through the valve of between about 10 liters per hour and 250 liters per hour.

20.

A pressure control valve, comprising:

a valve body having a valve bore through which a fluid may flow, the valve bore having a valve seat, a longitudinal axis and at least a portion with a diameter that increases non-uniformly from its upstream end closest to the valve seat to its downstream end; and

a valve ball yieldably biased to a closed position against the valve seat, and being moveable to an open position spaced from the valve seat to allow fluid to flow through the valve bore around the valve ball, for a given position of the valve ball relative to the valve seat an effective surface area of the valve ball is acted upon by the fluid tending to displace the ball in a direction away from the valve seat, and the effective surface area of the valve ball that is acted upon by the fluid increases as the valve ball is increasingly displaced away from the valve seat.

21.

The pressure control valve of claim 20 wherein the effective surface area of the valve ball that is acted on by the fluid is a function of an interface angle defined between the longitudinal axis of the valve bore and an interface line that defines the shortest distance between the valve ball and the valve bore, and said interface angle increases as the valve ball is increasingly displaced from the valve seat.

22.

The pressure control valve of claim 20 wherein the non-uniform portion of the valve bore is generally arcuate.

23.

The pressure control valve of claim 20 wherein the non-uniform portion of the valve bore is defined at least in part by a plurality of linearly tapered segments arranged so that the valve bore as a whole does not have a straight linear taper along its entire axial length.

24.

A method of making a pressure control valve, comprising the steps of:

forming a valve bore in a valve body so that the valve bore has a longitudinal axis, a valve seat and a non-uniform portion with a diameter that increases as the non-uniform portion extends away from the valve seat;

inserting a valve ball into the valve bore, the valve ball having a diameter greater than the diameter of the valve bore in the area of the valve seat but less than the diameter of the valve bore in the area of the non-uniform portion of the valve bore;

inserting a spring at least partially in the valve bore so that one end of the spring can engage and yieldably bias the valve ball toward the valve seat;

wherein, at least when the valve ball is displaced from the valve seat, an interface angle is defined between said longitudinal axis and an interface line intersecting a point on the valve head closest to the valve bore and a point of the valve bore closest to the valve head, and said step of forming the valve bore includes forming the non-uniform portion of the valve bore so that the interface angle increases as the valve head is increasingly displaced from the valve seat.

25.

The method of claim 24 wherein the step of forming the valve bore including forming the non-uniform portion of the valve bore so that the interface angle increases as the valve head is increasingly displaced from the valve seat, is performed by calculating the spring force at various positions of the valve ball spaced from the valve seat, determining an effective surface area of the valve ball on which a fluid at a predetermined pressure needs to act to offset the spring force at each position of the valve ball as desired, determining the interface angle that corresponds to each determined effective surface area for each position of the valve ball, and then forming the valve bore with a shape that provides the determined interface angle at each position of the valve ball.

26.

The method of claim 25 wherein the effective surface area and interface angle are chosen to provide a net force on the valve ball that offsets the increase in the spring force acting on the valve ball as the valve ball is increasingly displaced from the valve seat so that the pressure control valve has a substantially constant pressure response over a range of positions of the valve ball relative to the valve seat.